36. *(Once Amended)* The laser of claim 22, wherein the substrate is between about 100 microns and 1000 microns thick.

REMARKS:

This reply encompasses a bona fide attempt to overcome the rejections raised by the Examiner and the reasons why the applicant believes why the rejections should be withdrawn.

Detailed Action / Specification

The Applicants have submitted a clean copy and a marked up version in accordance with the correction requirement.

Detailed Action / Double Patenting

The Applicants have amended claims 34 – 36 to read on the independent claim 22. Since independent claim 22 is materially different from independent claim 1 the Examiner's double patenting objection has become obsolete.

Detailed Action / Claim objections

The Applicants have submitted renumbered claims 12 – 36 and have amended the dependent claims to correctly read on the renumber parental claims.

Detailed Action / 35 USC §112 rejections

In accordance with the Examiner's statement regarding omitting essential structural cooperative relationships of elements, the Applicants have amended the independent claims 1, 12, 22 to read on "a reflector deposited on one of said two surfaces that opposes said modified surface", which claims unambiguously the structural cooperative relationship between the "at least one modified surface of the substrate" and the 'reflector".

Regarding the Examiner's rejected limitation "front and back surfaces" of claims 6 and 29, the Applicants have amended claims 6 and 29 to read on the limitation "two surfaces" instead, which has been introduced in the independent claims by amendment.

Detailed Action / 35 USC §102 rejection

The Examiner cites Alcock et al as prior art reference. In that context, the Applicants hold that Alcock et al is materially different and not applicable as prior art reference. What Alcock et al teaches is a saturable reflector configured in a fashion that requires the impinging light beam to impinge the device through the substrate. See for example column 2, lines 24, 25 where it reads: "The light must now be incident on the quantum well structure from the substrate side." To minimize degrading reflection the substrate surface where the light impinges the device an anti reflection coating is deposited on that surface. See column 1, lines 65 – 67. Alcock's impinging surface is opposing the substrate's surface where the multiplayer reflector is deposited on. Hence Alcock's impinging surface corresponds to the "at least one modified surface" of the present invention. But whereas Alcock's surface is made anti reflective to improve the efficientcy of the device, the Applicants' surface is modified to tune an etalon effect, which knowingly includes tuning of reflectivity. For these reasons Alcock et al not only disqualifies as prior art reference but teaches away from the Applicants' invention. In that context, the Applicants have amended the independent claims 1, 12, 22 to more clearly claim the novel and unobvious aspects of their invention.

Detailed Action / 35 USC §103 rejection

The Examiner cites Alcock et al in combination with Weingarten et al and with regards to claims 23 – 24 Kortz et al. Since the Applicants have traversed Alcock et al as prior art

reference in the above, Applicants hold that the Examiner does not set forth a prima facie case of obviousness according to the MPEP 706.02(j)):

(A) the relevant teachings of the prior art relied upon, preferably with the reference to the relevant column or page number(s) and line number(s) where appropriate,

(B) the difference or differences in the claim over the applied reference(s),

(C) the proposed modification of the applied reference(s) necessary to arrive at the claimed subject matter, and

(D) an explanation why one of ordinary skill in the art at the time the invention was made would have been motivated to make the proposed modification.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined), must teach or suggest **all the claim limitations**. The teachings or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Applicant's disclosure. The initial burden is on the Examiner to provide some suggestion of the desirability of doing what the inventor has done. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the Examiner must present a convincing line of reasoning as to why the artisan would have found the

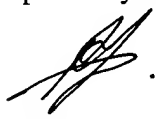
claimed invention to have been obvious in the light of the teachings. [*Underline and bold added to original text by Applicants*].

In addition, the Applicants hold that what Weingarten et al teaches is an exciton tuning (see for example column 5, lines 51 – 55). This is materially different than the Applicants' invention where an etalon tuning is provided. The Applicants refer to Fig. 3 and the corresponding teachings of the specification. Hence, Weingarten et al also disqualifies as a prior art reference.

In Conclusion

The Applicants have responded to all of the Examiner's requirements, objections and rejections and thus respectfully request the application being reconsidered and allowable subject matter pointed out in the next Office Action.

Respectfully submitted,



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MARKED-UP VERSIONS TO SPECIFICATION

Please amend page 6, under the brief description of the drawing the description of Figs. 1A and 1B according to the following marked up version.

Fig. **1A** [depicts a saturable Bragg reflector to the prior art] depicts a saturable Bragg reflector to a first embodiment of the present invention;

Fig. **1B** [depicts a saturable Bragg reflector to a first embodiment of the present invention] depicts a saturable Bragg reflector to the prior art;

MARKED-UP VERSIONS TO CLAIMS

Please amend Claim **1** with the following marked-up version.

1. A saturable reflector apparatus comprising:

   a) [a] an etalon at least partially provided by a substrate and at least one modified surface of two surfaces of said substrate [having a first surface and a second surface]; and

   b) a reflector [attached to one of the first and second surfaces] deposited on one of said two surfaces that opposes said modified surface such that an impinging light beam is initially propagating through said reflector and said substrate before reaching said at least one modified surface, wherein the reflector includes a saturable absorber layer;

   [wherein at least one of the first and second surfaces has been modified to enhance an etalon effect of the substrate].

Please amend Claim **6** with the following marked-up version.

6. The apparatus of claim 5 wherein the tuning means comprise means for adjusting an optical thickness between [the front and back] said two surfaces.

Please amend Claim **7** with the following marked-up version.

7. The apparatus of claim 6 wherein the adjusting means comprises a heat transfer element thermally coupled to the substrate via said modified surface, wherein the heat transfer element is chosen from the group consisting of heater elements and cooling elements.

Please amend Claim **12** with the following marked-up version.

12. A method for tuning a Saturable Reflector comprising the steps of:

a) providing [a] an etalon at least partially by a substrate and at least one modified surface of two surfaces of said substrate [having a first surface and a second surface] ;

b) [attaching] depositing a reflector on one of said two surfaces that opposes said modified surface [with a saturable absorber layer to the first surface];

c) [modifying at least one of the first and second surfaces to enhance an etalon effect of the substrate] initially impinging said reflector with a light beam; and

d) using said etalon [the etalon effect] to control a spectrum of radiation of said light beam propagating through said reflector and through said substrate before reaching said at least one modified surface [reflected from the saturable reflector].

Please amend Claim **13** with the following marked-up version.

13. (*Once Amended)* The method of claim [9] 12 wherein the modifying step comprises polishing at least one of the front and back surfaces to within a quarter wavelength of light that will be used with the SBR.

Please amend Claim **14** with the following marked-up version.

14. (*Once Amended)* The method of claim [9] 12 wherein the modifying step comprises coating at least one of the front and back surfaces with a reflective coating.

Please amend Claim **15** with the following marked-up version.

15. (*Once Amended)* The method of claim [11] 14 wherein the coating includes a metallic or a dielectric material.

Please amend Claim **16** with the following marked-up version.

16. (*Once Amended)* The method of claim [9] 12, further comprising the step of tuning the etalon effect.

Please amend Claim **17** with the following marked-up version.

17. (*Once Amended)* The method of claim [13] <u>16</u> wherein the tuning step comprises adjusting an optical thickness between the first and second surfaces of the substrate.

Please amend Claim **18** with the following marked-up version.

18. (*Once Amended)* The method of claim [14] 17 wherein the thickness is adjusted by controlling a temperature of the substrate.

Please amend Claim **19** with the following marked-up version.

19. (*Once Amended)* The method of claim [13] <u>18</u>, wherein the tuning adjusts a length of an optical pulse that is incident on the SBR.

Please amend Claim **20** with the following marked-up version.

20. (*Once Amended)* The method of claim [13] 16, wherein the tuning optimizes a relation between temporal and frequency domains of radiation incident on the SBR.

Please amend Claim **21** with the following marked-up version.

21. (*Once Amended)* The method of claim [13] 16 wherein the tuning adjusts a distribution of optical power amongst two or more modes of radiation incident on the saturable reflector.

Please amend Claim **22** with the following marked-up version.

22. A laser comprising:

a) an optical cavity;

b) a lasing medium disposed within the optical cavity;

c) a pump configured to provide pump radiation to the lasing medium; and

d) a saturable reflector optically coupled to the cavity, wherein the saturable reflector includes

i) [a] an etalon at least partially provided by a substrate and at least one modified surface of two surfaces of said substrate [having a first surface and a second surface]; and

ii) a reflector [attached to one of the first and second surfaces] deposited on one of said two surfaces that opposes said modified surface such that an impinging light beam is initially propagating through said reflector and said substrate before reaching said at least one modified surface, wherein the reflector includes a saturable absorber layer;

[wherein at least one of the first and second surfaces has been modified to enhance an etalon effect of the substrate].

Please amend Claim **23** with the following marked-up version.

23.(*Once Amended)* The laser of claim [19] 22 further comprising a non-linear medium disposed within the cavity. . .

Please amend Claim **24** with the following marked-up version.

24. *(Once Amended)* The laser of claim [20] 23 wherein the nonlinear medium is a crystal containing a material chosen from the group consisting of Lithium Niobate ($LiNbO_3$), Lithium Tantalate ($LiTaO_3$), Lithium Borate ($LiBO_3$) periodically poled lithium niobate (PPLN), periodically poled lithium tantalate (PPLT) MgO:PPLN, KTP, PPKTP, RTA, BBO, MgO:LN, KTA, and PPRTA.

Please amend Claim **25** with the following marked-up version.

25. *(Once Amended)* The laser of claim [19] 22 wherein the surface that has been modified to enhance the etalon effect has been polished.

Please amend Claim **26** with the following marked-up version.

26. *(Once Amended)* The laser of claim [19] 22 wherein the surface that has been modified includes a coating.

Please amend Claim **27** with the following marked-up version.

27. *(Once Amended)* The laser of claim [23] <u>26</u> wherein the coating includes a metallic or a dielectric material.

Please amend Claim **28** with the following marked-up version.

28. *(Once Amended)* The laser of claim [19] 22, further comprising means for tuning the etalon effect.

Please amend Claim **29** with the following marked-up version.

29. *(Once Amended)* The laser of claim [25] 28 wherein the tuning means adjusts an optical thickness between [the front and back] said two surfaces of the substrate.

Please amend Claim **30** with the following marked-up version.

30. *(Once Amended)* The laser of claim [26] 29 wherein the adjusting means comprises a heater element thermally coupled to the substrate.

Please amend Claim **31** with the following marked-up version.

31. *(Once Amended)* The laser of claim [27] 30, further comprising a temperature controller coupled to the heater element.

Please amend Claim **32** with the following marked-up version.

32. *(Once Amended)* The laser of claim [19] 22 wherein the substrate has a thickness large enough such that the substrate acts as an etalon having a free spectral range of the same order as a linewidth of the laser.

Please amend Claim **33** with the following marked-up version.

33. *(Once Amended)* The laser of claim [29] 32 wherein the free spectral range is of order 1 GHz.

Please amend Claim **34** with the following marked-up version.

34. *(Once Amended)* The laser of claim [1] 22 wherein the reflector is a Bragg stack, whereby the saturable reflector is a saturable Bragg reflector (SBR).

Please amend Claim **35** with the following marked-up version.

35. *(Once Amended)* The laser of claim [1] 22, wherein the reflector includes a metallic or dielectric film.

Please amend Claim **36** with the following marked-up version.

36. *(Once Amended)* The laser of claim [1] 22, wherein the substrate is between about 100 microns and 1000 microns thick.